



## Residential Swimming Pool Barrier--Guidelines

### Background--U.S. Consumer Product Safety Commission (CPSC)

Each year, thousands of American families suffer swimming pool tragedies—drownings and near-drownings of young children. The majority of deaths and injuries in pools and spas involve young children ages 1 to 3 and occur in residential settings. These tragedies are preventable. This City of Knoxville booklet offers guidelines for pool barriers that can help prevent most submersion incidents involving young children. This handbook is designed for use by owners, purchasers, and builders of residential pools, spas, and hot tubs. Barriers are not the sole method to prevent pool drowning of young children and cannot replace adult supervision. Research evidence has been reviewed showing that climbing is an inevitable and integral part of childhood development; Climbing is involved in the child's physical, psychological, and social development; Climbing skills are often taught and encouraged by parents, especially with boys, and climbing is a part of physical education at school.

### Swimming Pool Barrier Guidelines

Many of the nearly 300 children under 5 who drown each year in backyard pools could be saved if homeowners completely fenced in pools and installed self-closing and self-latching devices on gates. Anyone who has cared for a toddler knows how fast young children can move. Toddlers are inquisitive and impulsive and lack a realistic sense of danger. These behaviors make swimming pools particularly hazardous for households with young children. The CPSC reports that child drownings are the second leading cause of accidental death around the home for children under 5 years of age. In some southern or warm weather states, drowning is the leading cause of accidental death in the home of children under 5.

CPSC staff has reviewed a great deal of data on drownings and child behavior, as well as information on pool and pool barrier construction. The staff concluded that the best way to reduce child drownings in residential pools is for pool owners to construct and maintain barriers that will help to prevent young children from gaining access to pools and spas. The CPSC guidelines provide information for pool and spa owners to use to prevent children from entering the pool area unaccompanied by a supervising adult. They took into consideration the variety of barriers (fences) available and became the foundation for modern pool codes. The City of Knoxville enforces the barrier requirements of **Section 305** of the **2018 International Swimming Pool and Spa Code** which is based on the CPSC guidelines. You can find free access here: [2018 INTERNATIONAL SWIMMING POOL AND SPA CODE \(ISPSC\)](#).

The 2018 ISPSC swimming pool barrier guidelines are presented with illustrated descriptions of pool barriers. The definition of "pool" includes spas and hot tubs. The swimming pool barrier guidelines, therefore, apply to these structures as well as to above-ground pools and may include larger portable pools.

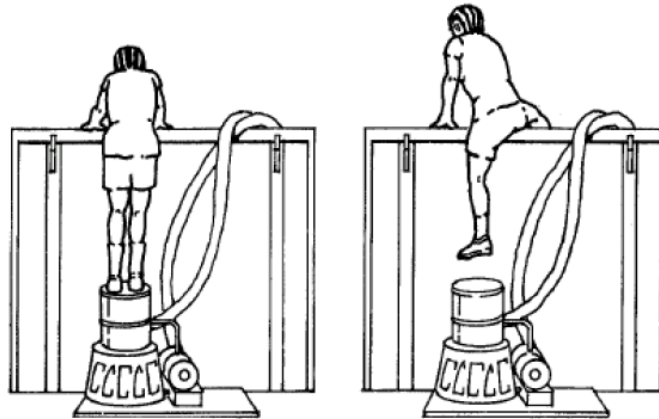


### Barriers

**Barriers** are **not** child-proof, but they provide layers of protection for a child when there is a lapse in adult supervision. Barriers give parents additional time to find a child before the unexpected can occur. Barriers include one or more of the following: a fence or wall, door and window alarms for the house, and a power safety cover over the pool. Please use the following as a guide.

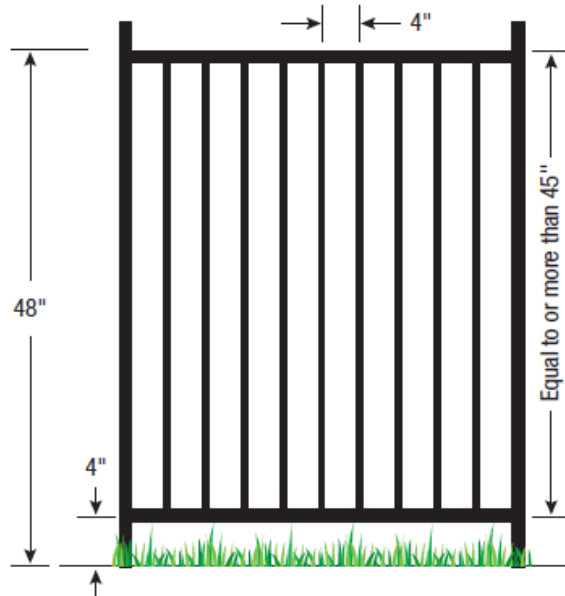
### Barrier Locations

Barriers shall be located to prohibit permanent structures, equipment, or similar objects from being used to climb the barriers. There shall be a **clear zone** of 36 inches between the exterior of the barrier and any permanent structures or equipment that can be used to climb.



### Fence as a Barrier

A fence completely surrounding the pool is better than one with the house serving as the fourth side. Fences shall be a minimum of **48 inches** high, although fences 5 feet or higher are preferable. If the home or other structure serves as one or more sides of the barrier, install door and window alarms on all openings leading to the pool area. Pool covers add another layer of protection and there are a wide variety of styles on the market. The barrier shall maintain **48 inches** in height for a distance of **36 inches** horizontally.

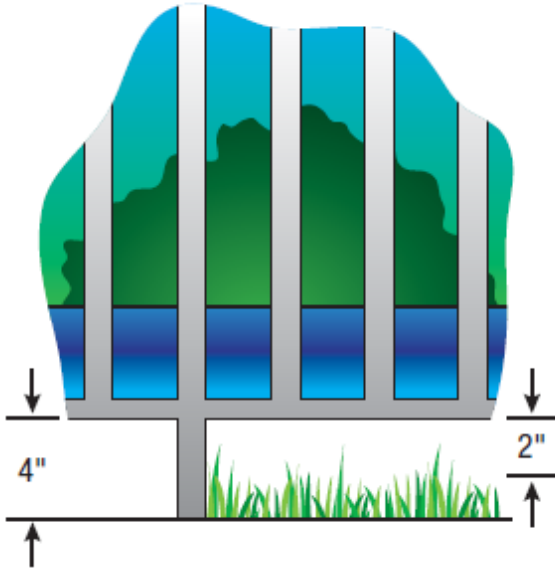




### Barrier Clearance From Grade

As measured on the side of the barrier that faces away from the pool or spa:

- The vertical clearance between a surface below the barrier, such as concrete, and the bottom of the required barrier shall not exceed 4 inches.
- The vertical clearance between grade and the bottom of the barrier shall not exceed 2 inches for grade surfaces that are not solid, such as grass or gravel.

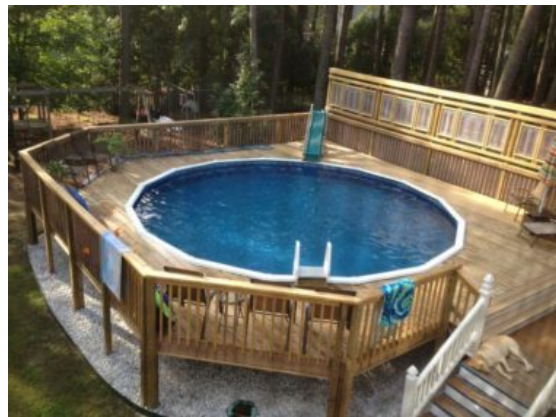
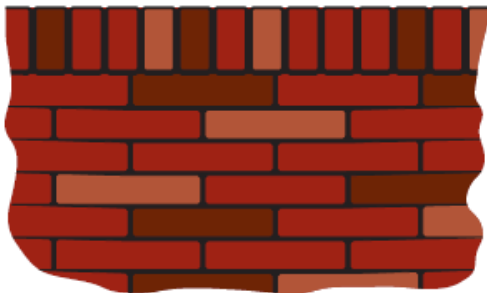


### How To Prevent a Child from Getting OVER a Pool Barrier

A young child can get over a pool barrier if the barrier is too low or if the barrier has handholds or footholds to use when climbing. Eliminate handholds and footholds and minimize the size of openings in a barrier's construction. Research has shown that climbing is an inevitable and integral part of childhood development.

### For a Solid Barrier

No indentations or protrusions shall be present, other than normal construction tolerances and masonry joints. Above-ground pools with decks **must** meet pool barrier requirements which may present unique challenges to providing a compliant barrier. Please contact us if you have questions!

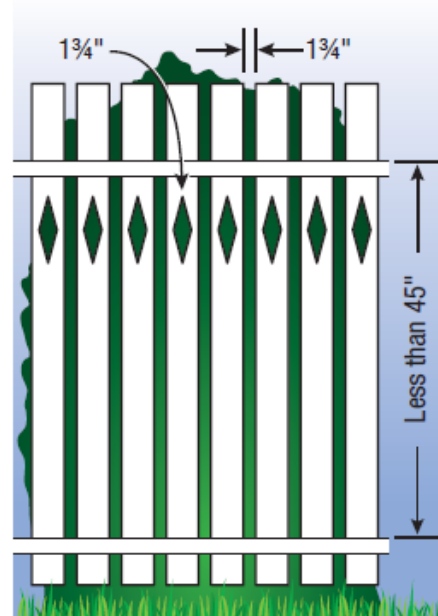


## For Barriers (Fences) Made Up of Horizontal and Vertical Members

Pool barriers comprised of horizontal and vertical members, such as a traditional picket and rail fence shall be designed so that it is not easily climbable depending on the following:

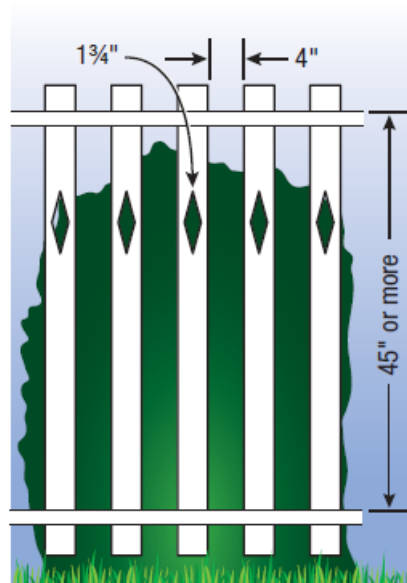
### Horizontal Members Less than 45 Inches

- If the distance between the top side of the horizontal members is [less than 45 inches](#), the horizontal members shall be on the swimming pool side of the fence.
- The spacing between vertical members and within decorative cutouts shall not exceed [1¾ inches](#).
- This size is based on the foot width of a young child and is intended to reduce the potential for a child to gain a foothold and attempt to climb the fence.



### Horizontal Members 45 or More Inches

- If the distance between the tops of the horizontal members is [more than 45 inches](#), the horizontal members can be on the side of the fence facing away from the pool.
- The spacing between vertical members shall not exceed [4 inches](#).
- This size is based on the head breadth and chest depth of a young child and is intended to prevent a child from passing through an opening.
- If there are any decorative cutouts in the fence, the space within the cutouts shall not exceed [1¾ inches](#).





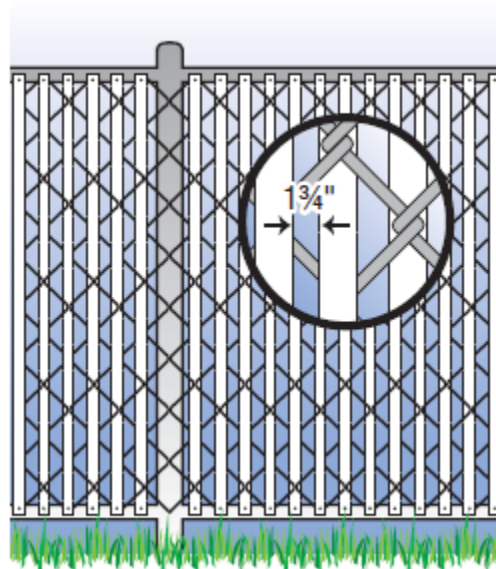
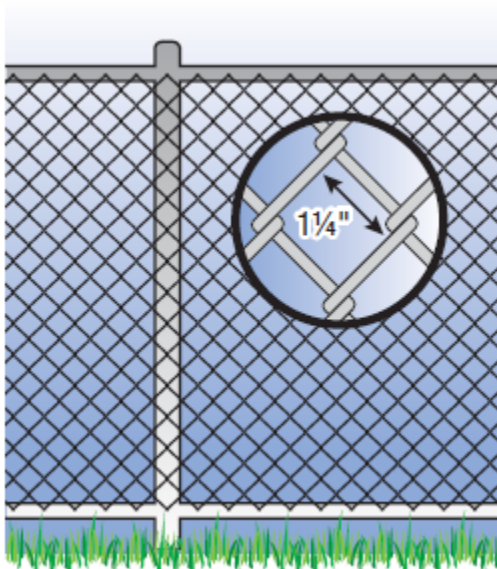
### Unique Horizontal and Vertical Fence Construction

Occasionally, unique barrier designs do not match the code criteria exactly, when this arises please contact the building inspector prior to constructing said barrier to review the specific design elements to determine if climbability is a concern.



### Chain Link Fences

[Chain link](#) fences can be acceptable as a swimming pool barrier while meeting the same criteria as a picket and rail style fence for reducing climb ability.





### Above-Ground Pools

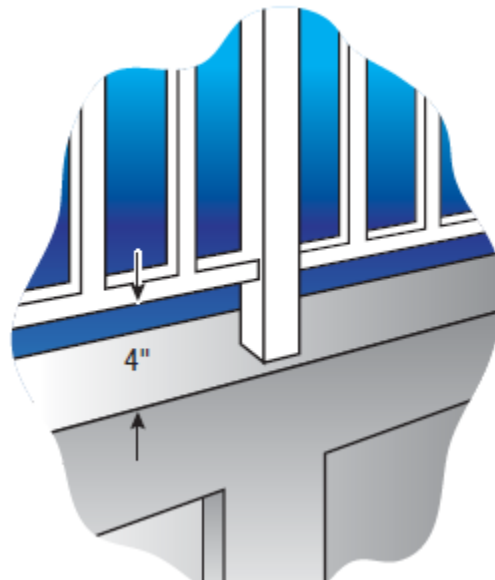
Above-ground pools shall have barriers. The pool structure itself serves as a barrier or a barrier is mounted on top of the pool structure. Such barriers shall be installed under the manufacturer's installation instructions. There are two possible ways to prevent young children from climbing up into an above-ground pool:

1. The steps or ladder can be designed to be secured, locked, or removed to prevent access, or...
2. The steps or ladder can be surrounded by a barrier such as those described in these guidelines.



### Above-Ground Pool with Barrier on Top of Pool

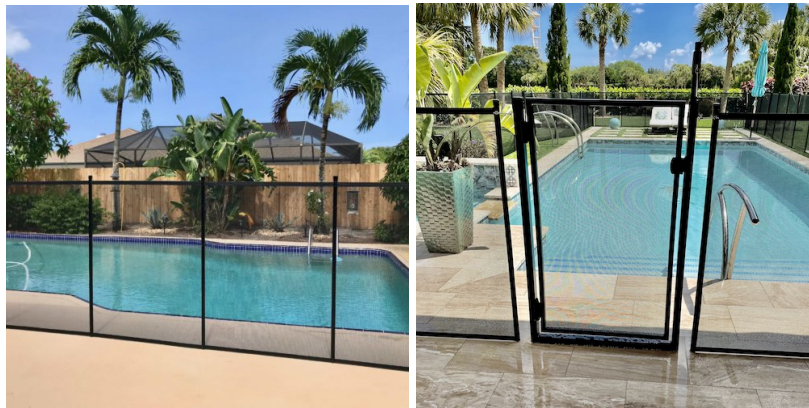
If an above-ground pool has a barrier on the top of the pool, the maximum vertical clearance between the top of the pool and the bottom of the barrier shall not exceed 4 inches.





### Removable Mesh Fences

Mesh fences are specifically made for swimming pools or other small bodies of water. Mesh barriers shall be installed in accordance with the manufacturer's installation instructions. Although mesh fences are meant to be removable, the safest mesh pool fences are locked into the deck so that they cannot be removed without the extensive use of tools. Like other pool fences, mesh fences shall be a minimum of 48" in height with the bottom of the mesh fence being not more than 1 inch above the pool deck. Hinged gates shall meet the requirements for fence gates. See [ISPSC Section 305.2.4](#) for more information.



### Pool Area Access Gates

There are two kinds of gates that might be found on residential property: pedestrian gates and vehicles or other types of gates. Both can play a part in the design of a swimming pool barrier. All gates shall be designed with a locking device.

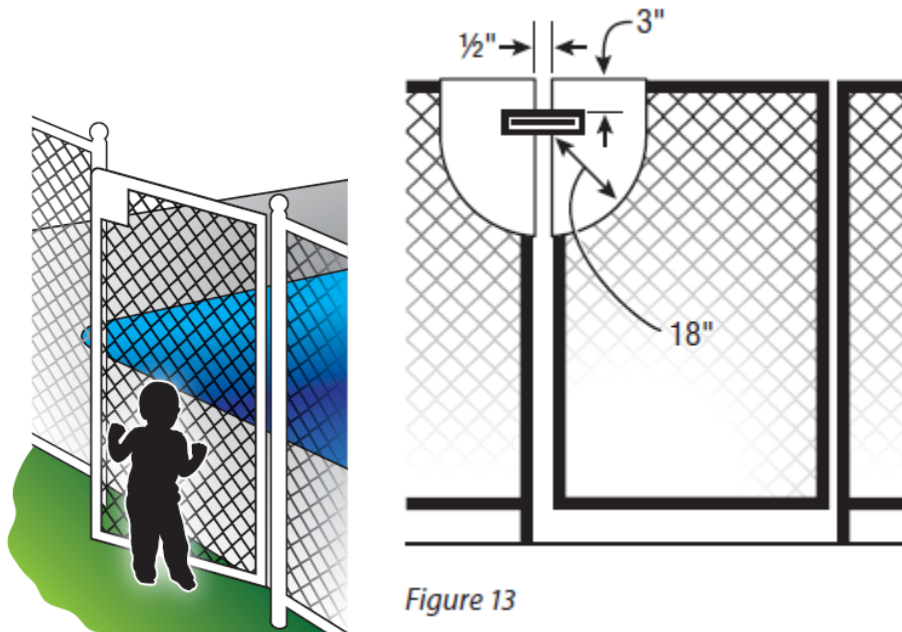


Figure 13



- **Pedestrian Gates**--These are the gates people walk through. Swimming pool barriers shall be equipped with a gate or gates which restrict access to the pool:
  - Gates shall **open out** from the pool and shall be **self-closing** and **self-latching**. If a gate is properly designed and not completely latched, a young child pushing on the gate to enter the pool area will at least close the gate and may engage the latch.
  - When the release mechanism of the self-latching device on the gate is less than 54 inches from the bottom of the gate, the release mechanism for the gate shall be at least 3 inches below the top of the gate on the side facing the pool. Placing the release mechanism at this height prevents a young child from reaching over the top of a gate and releasing the latch.
  - The gate and barrier shall have no opening greater than 1/2 inch within 18 inches of the latch release mechanism. This prevents a young child from reaching through the gate and releasing the latch.
- **Utility or Service Gates (Vehicle Entrances, Etc.)**--Other gates shall be equipped with self-latching devices. The self-latching devices shall be installed as described for pedestrian gates.

The weak link in the strongest and highest fence is a gate that fails to close and latch completely. For a gate to close completely every time, it must be in proper working order.

### **When the Structure Forms Part(s) of the Pool Barrier**

In many homes, doors, and windows open directly from the house onto the pool area or a patio leading to the pool. In such cases, the side of the house leading to the pool is an important part of the pool barrier. **Passage through any door or window from the house to the pool shall be controlled by security measures by either alarms or self-closing/latching.** Operable windows with a sill height of fewer than 48 inches above the floor shall have alarms. See [ISPSC Section 305.4](#)





*The importance of controlling a young child's movement from the house to the pool is demonstrated by the statistics obtained in CPSC's submersion reports. Residential locations dominate in incidents involving children younger than 5 accounting for 85% of fatalities and 54 percent of injuries (from CPSC's 2012 Pool and Spa Submersion Report).*

### **Door and Window Alarms--Requirements**

All doors and windows that allow access to a swimming pool shall be equipped with an audible alarm that sounds when the door and/or screen are opened. These alarms are wireless, battery-powered, inexpensive and readily available. Alarms shall meet the requirements of UL 2017 General-Purpose Signaling Devices and Systems, with the following features:

- Sound lasting for 30 seconds or more within 7 seconds after the door is opened.
- The alarm shall be loud: at least 85 dBA (decibels) when measured 10 feet away from the alarm mechanism.
- The alarm sound shall be distinct from other sounds in the house, such as the telephone, doorbell and smoke alarm.
- The alarm shall have an automatic reset feature to temporarily deactivate the alarm for up to 15 seconds to allow adults to pass through house doors without setting off the alarm.
- The deactivation switch could be a touchpad (keypad) or a manual switch and shall be located at least 54 inches above the threshold and out of the reach of children.

Self-closing doors with self-latching devices could be used in conjunction with door alarms to safeguard doors that give access to a swimming pool. See [ISPSC Section 305.4](#) for more information.



### **Tennessee State Law (Katie Beth's Law) [TCA Title 47, 68-14-805(a)]**

In accordance with Tennessee State Law, at time of final inspection, the pool shall be furnished with a water alarm meeting the following:

- **Alarm Function-** The alarm shall emit a sound of at least fifty (50) decibels when a person or an object weighing fifteen (15) pounds or more enters the water in a swimming pool, but shall not include, swimming protection alarm devices for individual use, such as an alarm attached to a child that sounds when the child exceeds a certain distance or becomes submerged in water.
- **Safety Standard-** It is required that the pool alarm complies with the voluntary safety standard: [ASTM F2208-02 Standard Specification for Pool Alarms](#).
- **Installation-** Pool alarms shall be installed in accordance with the manufacturer's installation instructions.
- **Quantity-** Depending on the alarm and the pool size, some pools may require multiple alarms for proper protection.



### **Power Safety Covers**

Power safety covers can be installed on pools to serve as security barriers in lieu of a fence, especially when the house serves as the fourth wall or side of a barrier. Power safety covers shall conform to the specifications of [ASTM F 1346-91\(2010\) Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs](#), which specifies safety performance requirements for pool covers to protect young children from drowning.





### **Summary--Barriers for Residential Swimming Pool, Spas, and Hot Tubs**

The preceding explanations of ISPSC's pool barrier requirements were provided to make it easier for pool owners, purchasers, builders, technicians, and others to understand and apply the guidelines to their particular properties or situations. Reading the guidelines in conjunction with the diagrams or figures previously provided may be helpful, and is not a replacement for a thorough understanding of the [International Swimming Pool and Spa Code](#).

### **Existing Pool Barrier or Fence?**

Planning a pool installation and intend to use an existing fence as the barrier? The existing fence may or may not meet the code for barrier requirements but we are here to assist you! Contact us @ [bldginspections@knoxvilletn.gov](mailto:bldginspections@knoxvilletn.gov) and we can meet with you to discuss pool barrier requirements.

### **Plan Review, Building Permit and Inspections**

**NEW** construction and installation of a spa, hot tub, inground or above-ground pool will require a plan review, building permit and inspections (except for prefabricated swimming pools that are less than 24 inches deep. [IRC R105.2](#)) During the course of construction of an inground pool and prior to using any pool the City shall be notified to make required safety inspections before the pool is used.

To begin the permit process, please go to the City's Permitting [Website](#).



### Required Documents

Step 2: You will then be emailed a link to upload documents to our online plan review portal, KnoxPlans. Follow the plan upload guidelines provided to you, and please upload the following documents to KnoxPlans:

1. **Site Plan** - A scaled or dimensioned plan of the property showing:
  - a. The new and existing structures/buildings and location of a new pool with dimensions to lot lines and structures.
  - b. The location of the pool barrier (fence).
  - c. The location of the associated pool deck, equipment, etc, and the setbacks of these features to the adjacent lot lines.
2. **Pool Barrier Details** - The design details of how and where the pool barrier will be located, including the location of access gates.
3. **Pool Alarm** - A specification sheet from the manufacturer of the pool water alarm(s).

**The building permit application can be found here:**

[Building Permit Applications](#)

### Conclusion

We look forward to assisting you in a timely completion of your swimming pool project. If you have any questions please contact us at 865.215.2999 or by email:

<mailto:bldginspections@knoxvilletn.gov>

**For more information on pool safety facts**

[Pool or Spa Submersion Report, 2021](#)

### Pool and Spa Submersions: Estimated Injuries and Reported Fatalities\*

CPSC publishes an annual report on submersion incidents. Key findings from the 2012 report include:

- Nearly 300 children younger than 5 drown in swimming pools and spas each year representing 75 percent of the 390 fatalities reported for children younger than 15.
- Children aged 1 to 3 years (12 months through 47 months) represented 67 percent of the reported fatalities and 66 percent of reported injuries in pools and spas.
- Over 4,100 children younger than 5 suffer submersion injuries and require emergency room treatment; about half are seriously injured and are admitted to the hospital for further treatment.
- The majority of drownings and submersion injuries involving victims younger than 5 occur in pools owned by the family, friends or relatives.
- The majority of estimated emergency department-treated submersion injuries and reported fatalities were associated with pools.



## Outdoor Swimming Pool Checklist

All outdoor swimming pools, including inground, above ground, or on-ground pools, hot tubs, or spas, shall have a barrier that complies with the following:

- The top of the barrier shall be at least 48 inches above the surface measured on the side of the barrier which faces away from the swimming pool.
- The maximum vertical clearance between the surface and the bottom of the barrier shall be 4 inches measured on the side of the barrier which faces away from the swimming pool. In the case of a non-solid surface, grass, or pebbles, the distance shall be reduced to 2 inches, and 1 inch for removable mesh fences.
- Where the top of the pool structure is above grade or surface, such as an above-ground pool, the barrier may be at ground level, such as the pool structure, or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches.
- Openings in the barrier shall not allow passage of a 4-inch diameter sphere.
- Solid barriers, which do not have openings, such as a masonry or stone wall, shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.
- Where the barrier is composed of horizontal and vertical members and the distance between the bottom and top horizontal members is less than 45 inches, the horizontal members shall be located on the swimming pool side of the fence.
- Spacing between vertical members shall not exceed 1 $\frac{3}{4}$  inches in width. Where there are decorative cutouts, spacing within the cutouts shall not exceed 1 $\frac{3}{4}$  inches in width.
- Maximum mesh size for chain link fences shall not exceed 1 $\frac{1}{4}$  inch square unless the fence is provided with slats fastened at 4-inches or the bottom which reduces the openings to no more than 1 $\frac{3}{4}$  inches.
- Where the barrier is composed of diagonal members, such as a lattice fence, the maximum opening formed by the diagonal members shall be no more than 1 $\frac{3}{4}$  inches.
- Access gates to the pool shall be equipped with a locking device.
- Pedestrian access gates shall open outward, away from the pool, and shall be self-closing and have a self-latching device.
- Gates other than pedestrian access gates shall have a self-latching device.
- Where the release mechanism of the self-latching device is located less than 54 inches from the bottom of the gate,
  - (a) the release mechanism shall be located on the poolside of the gate at least 3 inches below the top of the gate and



## Plans Review and Inspections Division

- (b) the gate and barrier shall have no opening greater than ½ inch within 18 inches of the release mechanism.
- Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:
  - (a) All doors with direct access to the pool through that wall shall be equipped with an alarm which produces an audible warning when the door and its screen, if present, are opened. Alarms shall meet the requirements of UL 2017 General-Purpose Signaling Devices and Systems.
  - (b) The pool shall be equipped with a power safety cover that complies with ASTM F 1346-91(2010)-Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas, and Hot Tubs listed below.
  - (c) Other means of protection, such as self-closing doors with self-latching devices, are acceptable so long as the degree of protection afforded is not less than the protection afforded by (a) or (b) described above.
- Where an above-ground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, then
  - (a) the ladder to the pool or steps shall be capable of being secured, locked or removed to prevent access, or
  - (b) the ladder or steps shall be surrounded by a barrier. When the ladder or steps are secured, locked, or removed, any opening created shall not allow the passage of a 4-inch diameter sphere.